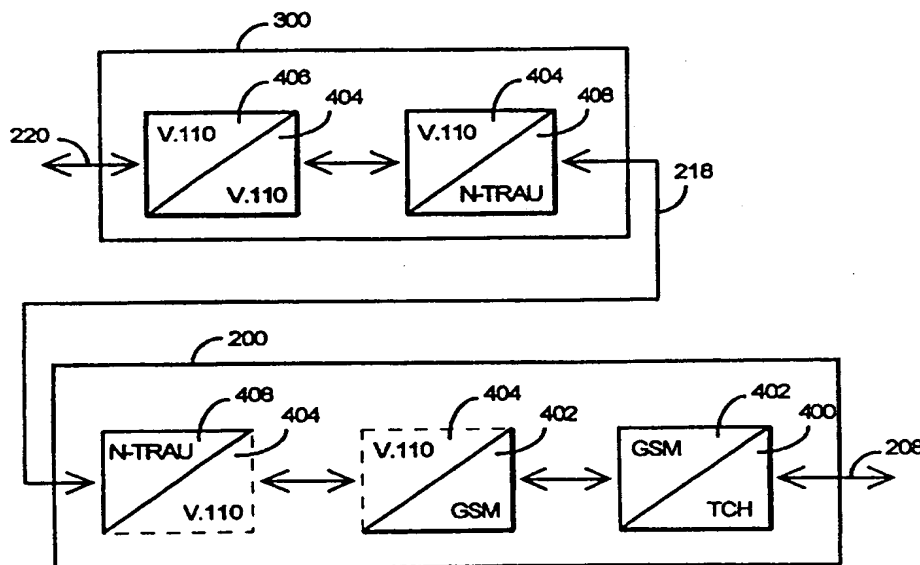




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04L 1/00, H03M 13/12, H04L 7/08, H04J 3/06		A1	(11) International Publication Number: WO 97/16899
			(43) International Publication Date: 9 May 1997 (09.05.97)
(21) International Application Number: PCT/FI96/00585 (22) International Filing Date: 31 October 1996 (31.10.96) (30) Priority Data: 955206 31 October 1995 (31.10.95) FI (71) Applicant (for all designated States except US): NOKIA TELECOMMUNICATIONS OY [FI/FI]; Upseerinkatu 1, FIN-02600 Espoo (FI). (72) Inventors; and (75) Inventors/Applicants (for US only): PIRHONEN, Riku [FI/FI]; Gyldenintie 10 E 85, FIN-00200 Helsinki (FI). RANTA, Pekka [FI/FI]; Servin Maijan tie 10 B 18, FIN-02150 Espoo (FI). SUVANEN, Jyri [FI/FI]; Väinö Auerin katu 1 G 24, FIN-00560 Helsinki (FI). (74) Agent: TEKNOPOLIS KOLSTER OY; c/o Oy Kolster AB, Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. In English translation (filed in Finnish).	

(54) Title: DATA TRANSMISSION METHOD



(57) Abstract

The invention relates to a data transfer method in a digital cellular radio network, the method comprising the step of channel coding the information to be transferred for transmission. In order to implement a data rate of 14.4 kbit/s in GSM type of cellular radio systems by employing one time slot only for data transmission, the channel coding according to the method of the invention comprises grouping bits to be transmitted in blocks having the minimum size of 288 bits, carrying out convolutional coding for said blocks with a code rate of 1/2 by using GSM convolutional coding polynomials, and puncturing the bits obtained by deleting bits from each block so that blocks containing no more than 456 bits will be obtained.

FOR THE PURPOSES OF INFORMATION ONLY

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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

TEKNOPOLIS KOLSTER OY
c/o Oy Kolster AB
Iso Roobertinkatu 23
P.O. Box 148
FIN-00121 Helsinki
FINLANDE

30-05-1997

Date of mailing (day/month/year) 21 May 1997 (21.05.97)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 42842/PCT/ko	
International application No. PCT/FI96/00585	International filing date (day/month/year) 31 October 1996 (31.10.96)

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

Name and Address

NOKIA TELECOMMUNICATIONS OY
Upseerinkatu 1
FIN-02600 Espoo
FINLAND

State of Nationality

FI

State of Residence

FI

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address

NOKIA TELECOMMUNICATIONS OY
Keilalahdentie 4
FIN-02150 Espoo
FINLAND

State of Nationality

FI

State of Residence

FI

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office ☒ the designated Offices concerned
☐ the International Searching Authority ☐ the elected Offices concerned
☐ the International Preliminary Examining Authority ☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Céline Faust <i>C Faust</i> Telephone No.: (41-22) 730.91.11
---	---

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REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. PCT/FI 96 / 0 0 5 8 5

International Filing Date 31 OCT 1996 (31-10-1996)

The Finnish Patent Office

PCT International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference (if desired) (12 characters maximum) 42842/PCT/ko

Box No. I TITLE OF INVENTION

Data transmission method

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

NOKIA TELECOMMUNICATIONS OY
Upseerinkatu 1
FIN-02600 Espoo
Finland

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (i.e. country) of nationality:

FI

State (i.e. country) of residence:

FI

This person is applicant for the purposes of:

☐

all designated States

☒

all designated States except the United States of America

☐

the United States of America only

☐

the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

PIRHONEN Riku
Gyldenintie 10 E 85
FIN-00200 Helsinki
Finland

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

FI

State (i.e. country) of residence:

FI

This person is applicant for the purposes of:

☐

all designated States

☐

all designated States except the United States of America

☒

the United States of America only

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the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒

agent

☐

common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

TEKNOPOLIS KOLSTER OY
c/o Oy KOLSTER Ab
Iso Roobertinkatu 23
P.O.Box 148
FIN-00121 Helsinki
Finland

Telephone No.

358-9-618821

Facsimile No.

358-9-602244

Teleprinter No.

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☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS	
<i>If none of the following sub-boxes is used, this sheet is not to be included in the request.</i>	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)</i> RANTA Pekka Servin Maijan tie 10 B 18 FIN-02150 Espoo Finland	This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i>
State (i.e. country) of nationality: FI	State (i.e. country) of residence: FI
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)</i> SUVANEN Jyri Väinö Auerin katu 1 G 24 FIN-00560 Helsinki Finland	This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i>
State (i.e. country) of nationality: FI	State (i.e. country) of residence: FI
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)</i> (Empty)	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i>
State (i.e. country) of nationality:	State (i.e. country) of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
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The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

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- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

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|--|--|
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| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> MG Madagascar |
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In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of _____

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM		Further priority claims are indicated in the Supplemental Box <input type="checkbox"/>	
The priority of the following earlier application(s) is hereby claimed:			
Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1) FI	(31.10.1995) 31 October 1995	955206	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☐ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s) :

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA / SE

Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request.

Country (or regional Office): Date (day/month/year): Number:

Box No. VIII CHECK LIST

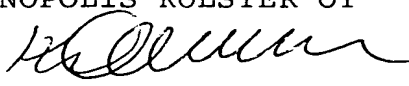
<p>This international application contains the following number of sheets:</p> <p>1. request : 4 sheets</p> <p>2. description : 12 sheets</p> <p>3. claims : 3 sheets</p> <p>4. abstract : 1 sheets</p> <p>5. drawings : 8 sheets</p> <p style="text-align: right;">Total : 28 sheets</p>	<p>This international application is accompanied by the item(s) marked below:</p> <p>1. <input checked="" type="checkbox"/> separate signed power of attorney 5. <input checked="" type="checkbox"/> fee calculation sheet</p> <p>2. <input type="checkbox"/> copy of general power of attorney 6. <input type="checkbox"/> separate indications concerning deposited microorganisms</p> <p>3. <input type="checkbox"/> statement explaining lack of signature 7. <input type="checkbox"/> nucleotide and/or amino acid sequence listing (diskette)</p> <p>4. <input checked="" type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 8. <input checked="" type="checkbox"/> other (specify): Copy of Official Action</p>
---	---

Figure No. 4b of the drawings (if any) should accompany the abstract when it is published.

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

TEKNOPOLIS KOLSTER OY

by 

Krister Dahlström

For receiving Office use only		<p>2. Drawings:</p> <p><input type="checkbox"/> received:</p> <p><input type="checkbox"/> not received:</p>
1. Date of actual receipt of the purported international application:	31 OCT 1996 (31.10.96)	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority specified by the applicant: ISA / SE	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid	

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Date of receipt of the record copy by the International Bureau:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 42842/PCT/nu	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI96/00585	International filing date (day/month/year) 31.10.1996	Priority date (day/month/year) 31.10.1995
International Patent Classification (IPC) or national classification and IPC ₆ H 04 L 1/00, H 03 M 13/12, H 04 L 7/08, H 04 J 3/06		
Applicant NOKIA TELECOMMUNICATIONS OY ET AL.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 14.05.1997	Date of completion of this report 29.01.1998
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Christian Rasch Telephone No. 08-782 25 00

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI96/00585

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

- ☒ the international application as originally filed.
- ☐ the description, pages _____, as originally filed,
 pages _____, filed with the demand,
 pages _____, filed with the letter of _____,
 pages _____, filed with the letter of _____.
- ☐ the claims, Nos. _____, as originally filed,
 Nos. _____, as amended under Article 19,
 Nos. _____, filed with the demand,
 Nos. _____, filed with the letter of _____,
 Nos. _____, filed with the letter of _____.
- ☐ the drawings, sheets/fig _____, as originally filed,
 sheets/fig _____, filed with the demand
 sheets/fig _____, filed with the letter of _____,
 sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

PCT/FI96/00585

1. Statement

Novelty (N)	Claims	<u>1-18</u>	YES
	Claims	<u></u>	NO
Inventive step (IS)	Claims	<u>4-8, 17, 18</u>	YES
	Claims	<u>1-3, 9-16</u>	NO
Industrial applicability (IA)	Claims	<u>1-18</u>	YES
	Claims	<u></u>	NO

The claimed invention relates to a data transmission method in a digital cellular radio network. The method comprises channel coding of the information. The channel coding comprises grouping of bits in blocks having a maximum size, convolutional coding and puncturing the convolutional coded bits. The convolutional coding is carried out with GSM polynomes.

D1) EP 660558 A2

From D1 a data transmission method comprising channel coding of the information to be transmitted is previously known. The known method comprises convolutional coding and puncturing of the obtained bits and that the blocks containing information has predefined sizes. (See column 6, line 20-line 56)

It must be considered obvious for a person skilled in the art to choose the size of the blocks to achieve the best transmission results possible. Therefore the invention claimed in claim 1 and 3 must be considered to lack an inventive step.

Consequently, the invention claimed in claims 2 and 10 is also considered to lack an inventive step.

The invention claimed in claims 11-16 must be considered obvious steps for a person skilled in the art when to develop a transmission method according to claim 10. Consequently, the invention claimed in claims 11-16 is considered to lack an inventive step.

It is obvious for a person skilled in the art that bits might be inverted prior to the transfer and deinverted after the transfer. Therefore the invention claimed in claim 9 is considered to lack an inventive step.

..... /

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI96/00585

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Box V

Since D1 does not relate to transcoding frames the invention claimed in claims 4-8 and 17-18 must be considered to be novel and to include an inventive step.

The claimed invention is considered to be novel and the requirements of technical applicability is also considered to be fulfilled.

The invention claimed in claims 4-8, 17 and 18 is considered to involve an inventive step.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI96/00585

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

It appears to be an error in claim 12. The text of said claim says that the claim is dependant of claim 12. This it considered as an error.

INTERNATIONAL SEARCH REPORT
Information on patent family members

28/10/96

International application No.

PCT/FI 96/00585

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A2- 0660558	28/06/95	CN-A- 1117252 JP-A- 7212251 GB-A- 2294616 GB-D- 9421579	21/02/96 11/08/95 01/05/96 00/00/00
US-A- 5438590	01/08/95	AU-A- 7044294 CA-A- 2140851 CN-A- 1111469 EP-A- 0651926 JP-T- 7506477 WO-A- 9428656	20/12/94 08/12/94 08/11/95 10/05/95 13/07/95 08/12/94
US-A- 5029331	02/07/91	CA-A- 1310757 DE-A- 3724729 DE-D- 3852794 EP-A,B- 0301161 JP-A- 1044132	24/11/92 02/02/89 00/00/00 01/02/89 16/02/89
US-A- 5383219	17/01/95	AU-A- 1187295 BR-A- 9405789 CN-A- 1116475 EP-A- 0680675 FI-A- 953501 IL-D- 111689 JP-T- 8506467 US-A- 5461639 WO-A- 9515038 ZA-A- 9408424	13/06/95 12/12/95 07/02/96 08/11/95 20/07/95 00/00/00 09/07/96 24/10/95 01/06/95 29/06/95